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ORGANIZATION OF AFRICAN UNITY
SCIENTIFIC TECHNICAL AND RESEARCH COMMISSION

JOINT PROJECT 31: SEMI-ARID FOOD GRAINS RESEARCH AND DEVELOPMENT
SAFGRAD II

MAIZE AND COWPEA COLLABORATIVE RESEARCH NETWORKS FOR WEST AND CENTRAL AFRICA

A N N U A L R-E-P-O-R-T
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FUNDED BY :
UNITED STATES AGENCY FOR INTERNATIONAL DEVELOPMENT
(USAID)

INTERNATIONAL INSTITUTE OF TROPICAL AGRICULTURE
OYO ROAD
PMB 5320
IBADAN, NIGERIA

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OUA/CSTR

S A F G R A D II.

MAIZE ANC COWPEA COLLABORATIVE RESEARCH NETWORKS FOR WEST AND CENTRAL AFRICA

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R E P O R T

1 9 8 9 / 9 0

SEMI-ARID FOOD GRAIN RESEARCH AND DEVELOPMENT
INTERNATIONAL INSTITUTE OF TROPICAL AGRICULTURE
SAFGRAD-IITA 01 B.P. 1495 OR 1783
OUAGADOUGOU
BURKINA FASO

Funded by : United States Agency for International Development

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PREFACE

This report covers the activities of the IITA/SAFGRAD Project on the Maize and Cowpea Collaborative Research Networks for West and Central Africa for the period April 1, 1989 to March 31, 1990.

During this period, the activities of the Networks were implemented by national programs of member countries according to the programs developed by their respective Steering Committees which met regularly to monitor and review the progress of project implementation. The Committees also played a principal role in the preliminary discussion organized by the SAFGRAD Coordination Office for the Phase III Project planning.

ABBREVIATIONS.

ACPO	Accelerated Crop Production Officer.
BRA	Bureau de Recherche Agronomique, Tchad.
CIMMYT	Centro Internacional de Mejoramiento de Maiz y Trigo.
CIRAD	Centre de Coopération Internationale en Recherche Agronomique pour le Développement.
CORAF	Conférence des Responsables de la Recherche Agronomique Africains et Français.
CRPA	Centre Régional de Production Agro-Pastorale.
DPV	Direction de la Production Végétale.
FAM	France-African Maize Network.
GLIP	Grain Legume Improvement Program, IITA.
IARC	International Agricultural Research Center.
ICRISAT	International Crops Research Institute for the Semi-Arid Tropics.
IDR	Institut de Développement Rural.
INERA	Institut d'Etudes et de Recherches Agricoles.
INRAN	Institut National de Recherches Agronomiques du Niger.
IITA	International Institute of Tropical Agriculture.
NARS	National Agricultural Research Systems.
RENACO	Réseau Niébé d'Afrique Centrale et Occidentale (West and Central Africa Cowpea Network).
SAFGRAD	Semi-Arid Food Grain Research and Development.
SCO	SAFGRAD Coordination Office, Ouagadougou.
SPAAR	Special Program for African Agricultural Research.
USAID	United States Agency for International Development.
WECAMAN	West and Central Africa Maize Network.

ACKNOWLEDGEMENTS

The IITA/SAFGRAD Project gratefully acknowledges the continued support from the Governement and people of Burkina Faso. In particular, the Ministry of Higher Education and Scientific Research assisted in providing land and other facilities at Kamboinse, Saria, Farako-Bâ, Vallée du Kou, and Gampela Stations. Land provided by the Ministry of Agriculture at Loumbila and Pobe (Djibo) enabled the provision of the necessary technical support to sustain the Networks collaborative activities. The excellent cooperation of the Director of the "Institut d'Etudes et de Recherches Agricoles (INERA), Heads of Research Stations, and the Directors of the "Direction de la Production Végétale (DPV)" facilitated the successful execution of Network activities.

Enthusiastic support from the Directors of Agricultural Research in the National Agricultural Research Systems (NARS) of the Networks member countries is gratefully acknowledged, and active participation of researchers of the National Maize and Cowpea Programs contributed largely to the successful operation of these Networks.

The Project commends the logistic support received from the SAFGRAD Coordination Office, especially in facilitating effective communication with NARS. Prompt and effective administrative and technical backstopping from IITA Headquarters at Ibadan, Nigeria, significantly contributed to the successful implementlation of the programs of the Collaborative Research Networks.

Other IARCs and Organizations namely CIMMYT, ICRISAT, CIRAD, IDR (University of Ouagadougou) and many CRPA Directors, ACPO Program in Togo, and USAID/Burkina Faso co-operated fully with this project.

Finally, the IITA/SAFGRAD Project deeply appreciates the allocation of funds by the United States Agency for International Development (USAID) which fully financed the project activities presented in this report.

Ouagadougou
April, 1990

Joseph M. Fajemisin
Project Leader and
Coordinator, Maize
Research Network.

DECLARATION

Mention of a particular pesticide, any other chemicals or products in this document does not imply endorsement of, or discrimination against any manufactured products by IITA/SAFGRAD.

IITA/SAFGRAD PERSONNEL

Principal Staff

Dr. J.M. Fajemisin	Maize Network Coordinator and Project Leader IITA/SAFGRAD
Dr. N. Muleba	Cowpea Network Coordinator

Support Staff

Mr. Jeremy Ouedraogo	Research Associate, Cowpea Breeder
Mr. Boukari Bandaogo	Accountant and Store Supervisor
Mrs. Rachel Ouedraogo	Secretary
Mr. B. Morgan Kamboke	Secretary
Miss. Aminata Bohena	Secretary
Mr. Raymond Sanduidi	Field Technician (Maize)
Mr. Victor Tapsoba	Field Technician (Cowpea)
Mr. Maurice Sawadogo	Facilitation Clerk
Mr. Seydou Ouedraogo	Mechanic-Driver
Mr. Martin N. Akpaloo	Driver-Mechanic
Mr. Cisse Issa	Driver
Mr. Daniel Ouedraogo	Office Boy.

INTRODUCTION

SAFGRAD Phase II is an extension of the original SAFGRAD Project whose global objective was the enhancement of the productivity and production of essential food grain crops, namely, sorghum, millet, maize and cowpea in the semi-arid zone. In reviewing the progress made in SAFGRAD Phase I and deliberating on the thrust of SAFGRAD Phase II, the Council of Directors of Agricultural Research from SAFGRAD member countries at their meeting of 23-27 February 1987 at Ouagadougou decided that collaborative research networks should be established for maize, cowpea, millet and sorghum. The major emphasis of the Networks is to exploit and maximize the use of limited resources and expertise of scientists within the region to strengthen NARS research capabilities in order to achieve the objectives of their respective national programs. IITA accepted responsibility for implementation of the Maize and Cowpea Networks for the West and Central Africa sub-region. The other two, namely, West and Central Africa Sorghum Collaborative Network and East African Sorghum and Millet Collaborative Network were contracted to ICRISAT.

In pursuance of the decisions of the NARS Directors of Research, SAFGRAD Coordination Office, in collaboration with IITA, organized a workshop for scientists working on maize and cowpea in the 18 SAFGRAD member countries in West and Central Africa from 23 to 27 March, 1987 at Ouagadougou. Researchable maize and cowpea production constraints were inventorized by national scientists during the Workshop together with the infrastructure, resources and skilled manpower available in the sub-region. In addition to inventorizing common production and research constraints relatively strong and weak national programs specific to each Network were identified in order to develop a strategy for the Networks.

A Steering Committee of 6 competent national full-time scientists and the Coordinator of the relevant network together with an observer each from IITA, USAID and SAFGRAD Coordination Office (SCO) was elected for each network by the national scientists with the responsibility of planning and monitoring the activities of the Network. The Committee established research priorities for the Network and assigned research responsibilities to relatively strong national programs referred to as "Lead Centers". For each Network, promising technologies developed by IITA-Ibadan, IITA/SAFGRAD's resident research and including, in the case of maize, CIMMYT were identified and the respective Coordinator mandated to therefrom design regional trials for distribution, on request, to national programs.

The Maize-Cowpea Joint Workshop held in Lome, Togo, March 20-24, 1989 provided a forum for national scientists to present their findings. Research activities of the Lead Centers, other NARS and IITA were discussed and appraised. Promising technologies were nominated by the Steering Committee for the 1989 regional trials. Efforts were intensified through several means of interaction to improve scientists' skills and the provision of limited financial support and research equipment.

This report which covers the period of April 1, 1989 to March 31, 1990 highlights the following aspects for each Network:

- Collaborating national programs/scientists,
- Management of the Network ,
- Strengthening national programs,
- Major problems encountered, and
- Recommendation for improvement and follow-up activities for the next year.

EXECUTIVE SUMMARY

The principal objective of establishing the Maize and Cowpea Collaborative Research Networks for West and Central Africa is to develop the capacity and initiative of the NARS maize and cowpea scientists to carry out research for the generation of appropriate technologies. Three years after launching the enabling Project (SAFGRAD Phase II), it is gratifying to report that the operational procedure for the Networks is firmly in place and remarkable progress has taken place in both Networks. The Steering Committee of each network, composed of active NARS scientists, provides concerted leadership through program planning, monitoring, and review.

The sixth and seventh meetings of the Steering Committee of each Network were held in Ouagadougou, Burkina Faso November 6-10, 1989 and March 26-30, 1990, respectively. During the November meeting, the Committee reviewed the activities of the Network during the growing season as monitored by visits of the Network Coordinator and those of the members of the Steering Committee to assigned national programs. The March meeting reviewed the results of collaborative research projects assigned to Lead Centers as well as the results of the regional trials coordinated by each Network. Research work-plans were assessed for the 1990 collaborative projects.

The 1989 annual progress reports received from the Lead Centers were discussed by the respective Steering Committees and were found to be very encouraging. Togo, for example has, with necessary modification to suit the local conditions, adopted the streak screening technology developed by IITA to operate mass-rearing of viruliferous streak-virus vector. Streak-resistant plants have been selected from crosses between the Togo local floury maize and streak resistant introduced varieties.

Out of the 53 sets of regional trials sent by the Cowpea Network, feedback had been received on 42 trials. Some new cowpea cultivars with good seed quality performed very well across locations within West and Central Africa. Eighty four sets of three types of maize regional trials were requested by 15 countries in 1989 with 65 % data recovery and increased level of precision. It is interesting to note that, for each Network, the number of varieties contributed by the national programs in the regional variety trials has increased over the years.

The Networks sponsored several activities during the year to improve the capacity of national programs to effectively carry out cowpea and maize research. Both formal group courses and informal on-the-job training, through visits of the Coordinators and members of Steering Committees to national programs, were conducted. IITA provided technical backstopping through visits to GLIP and Maize Program scientists to national programs and by invitation to IITA annual research program review meetings and as visiting collaborating scientists. This afforded national scientists to interact with IITA maize/cowpea scientists.

Some of the cowpea and maize varieties developed or promoted by the Networks are already being cultivated by farmers in many countries, notably Benin, Cameroon, Ghana, Guinea Bissau, Mali, and Togo. Special mention must be made of the cowpea variety SUVITA-2 developed in Burkina Faso which has been widely accepted in the Seno province of Mali because of its high yield, good seed quality and resistance to Striga. Among the maize varieties released or at pre-release stage are DMR-ESRY, DMR-ESRW, Pool 16 DR and EV8431-SR.

Finally, since scarcity of trained manpower is the principal constraint to attaining the project objective of handing-over the leadership of the Networks to NARS within the shortest time possible, the Steering Committees elaborated training schedule involving all the Networks' member countries as a vital component of the next phase of the Project. This is, of course, additional to the solicited increased commitment of policy makers in the various countries for adequate investment in agricultural research.

MAIZE NETWORK ANNUAL REPORT 1989/90

I. COLLABORATING NATIONAL PROGRAMS AND NATIONAL PROJECT COORDINATORS

1.1. MAIZE NETWORK LEAD CENTERS

1. Burkina Faso - Research responsibilities : Breeding for early and extra-early maize and for drought resistance/tolerance.

   - Project Coordinator :

     . Mr. Hema Idrissa
     Station de Kamboinse, INERA
     B.P. 7192, Ouagadougou

2. Cameroon - Research responsibilities : Breeding for maize of different maturities, drought resistance/tolerance and Striga tolerance. Agronomy.

   - Project Coordinator :

     . Dr. Charles Thé
     IRA/NCRE
     B.P. 2067, Yaoundé

3. Côte D'Ivoire - Research responsibilities : Breeding for stem borer resistance and for maize of different maturities.

   - Project Coordinator :

     . Mr. Attiey Koffi
     IDESSA, B.P. 633, Bouake

4. Ghana - Research responsibilities : Breeding for maize of different maturities and for streak resistance.

   - Project Coordinator :

     . Dr. B. Badu-Apraku
     Crops Research Institute
     P.O. Box 3785, Kumasi

5. Nigeria
- Research responsibilities : Agronomy.
- Project Coordinator :
  - Dr. K.A. Elemo
    Institute of Agric. Research,
    Samaru, PMB 1044, Zaria

6. Togo
- Research responsibilities : Development of streak resistance screening facilities and breeding of streak resistant varieties.
- Project Coordinator :
  - Dr. Esseh-Yovo Mawule
    DRA, B.P. 2318, Lome

1.2. OTHER MEMBER-COUNTRIES

Benin :
Mr. Romuald A. Dossou
Station d'Ina
B.P. 3, N'Dali

Cape Verde :
Mr. Carlos Silva
INIA, B.P. 50, Praia

Central Afr. Rep.:
Directeur de la Coordination Agricole
Ministère du Développement Rural
B.P. 786, Bangui

Gambia :
Mr. Musa Mbenga
Sapu Agric. Station
Dept. of Agricultural Research
Sapu

Guinea-Conakry :
Mr. Sekouma Camara
Centre d'IRAG de Kilissi
B.P. 576, Conakry

Guinée-Bissau :
Mme Isabel Miranda
C.P. 71, Bissau

Mali	:	Mr. Ntji Coulibaly Station de Sotuba, B.P. 438, Bamako
Mauritania	:	Mr. Sidi R'chid CNRADA, B.P. 22, Kaedi
Niger	:	Mr. P.L. Visser INRAN, B.P. 429, Niamey
Senegal	:	Mr. Abdou Ndiaye ISRA, B.P. 240 CRA/Fleuve Saint Louis
Tchad	:	Chef du Bureau de la Recherche Agronomique Ministère de l'Agriculture B.P. 441, N'Djamena.

II. MAIZE NETWORK MANAGEMENT

The Steering Committee provided direction and leadership to the Network through programming and follow-up on implementation. The sixth and the seventh meetings of the Committee were held during the year under review.

2.1. SIXTH STEERING COMMITTEE MEETING

The sixth biannual meeting of the Maize Steering Committee was held November 6-10, 1989 at Ouagadougou, Burkina Faso.

In attendance were :

- Members of the Steering Committee

Dr. Esseh-Yovo Mawule (Togo) -- Chairman
Dr. B. Badu-Apraku (Ghana) --English Secretary
Dr. Charles Thé (Cameroon) --French Secretary
Mr. Attiey Koffi (Côte D'Ivoire)
Mr. Abdou Ndiaye (Senegal)
Dr. J.M. Fajemisin --Network Coordinator

- Observers and resource persons

Dr. J.M. Menyonga (International Coordinator, --OAU/STRC SAFGRAD)

Dr. Taye Bezuneh (Director of Research, SAFGRAD)

Dr. G. Kingma (Senior Technical Advisor, SAFGRAD-USAID/BF)

Dr. George Weber (IITA Maize Program Scientist)

Dr. J.C. Sentz (USAID-IITA Liaison Scientist)

Dr. K.A. Elemo (Agronomist, Institute of Agric Research, Samaru, Nigeria).

The followings were discussed at the meeting :

i) Status of the Lome Workshop proceedings,
ii) Report of Network Coordinator on Network Activities including visits to nine National programs,
iii) Reports of Steering Committee members on visits to assigned National Programs,
iv) Status reports on collaborative research activities by Lead Centres,

v) Status report on harmonization of activities of SAFGRAD and CORAF Maize Networks,

vi) Prospects of Quality Protein Maize in the sub-region,

vii) 1990 Activities Forward Planning : monitoring tour, regional trials, and the selection of countries for technicians' training,

viii) SAFGRAD III Strategic Plan.

Details of the deliberation and decisions taken are provided in the "Report of the Sixth Steering Committee Meeting".

Recommendations

The Steering Committee made the following recommendations :

1. In view of the importance of and urgency for conserving maize landraces in the sub-region, the Committee recommended that a germplasm bank for maize be established for the West and Central African sub-region.

2. It was recommended that studies be conducted to determine the most appropriate time to apply fertilizer to extra-early maize for potential performance.

2.2. SEVENTH STEERING COMMITTEE MEETING

The meeting took place March 26-30, 1990 at Ouagadougou, Burkina Faso.

The following people were in attendance :

- Members of the Steering Committee

Dr. Charles Thé (Cameroon) --Chairman 1990/91
Dr. B. Badu-Apraku (Ghana) --English Secretary
Mr. Abdou Ndiaye (Senegal) -- French Secretary
Dr. Esseh-Yovo Mawule (Togo)
Mr. R.A. Dossou (Benin)
Dr. J.M. Fajemisin --Network Coordinator.

Mr. Attiey Koffi of Côte D'Ivoire was absent with apology.

- Observers and resource persons

Dr. J.M. Menyonga (International Coordinator, SAFGRAD OAU/STRC)

Dr. Taye Bezuneh (Director of Research, SAFGRAD)

Dr. G. Kingma (Senior Technical Advisor, SAFGRAD-USAID/BF)

Dr. K.A. Elemo (Agronomist, Institute of Agricultural Research, Samaru, Nigeria)

IITA Maize Program sent in apologies for not being able to be represented at the meeting.

After the election of the Chairman and the Secretaries for the 1990/91 year, the followings were discussed:

(i) Reports of 1989 collaborative research activities by Lead Centers,

(ii) Work-Plan for 1990 collaborative research by Lead Centers,

(iii) 1990 Monitoring Tour Itinerary,

(iv) Plan for 1990 visits to National programs by Network Coordinator and members of the Steering Committee,

(v) Preparatory discussion to facilitate the SAFGRAD-CORAF Maize Networks' Harmonization Committee Meeting scheduled for May 7-9, 1990,

(vi) 1991 Joint Seminar for maize, cowpea, sorghum and millet research agronomists,

(vii) March 1991 Joint Maize/Cowpea/Sorghum/Millet Workshop,

(viii) Allocation of funds to National Programs in support of maize research,

(ix) Seed and seed production activities in National Programs,

(x) SAFGRAD III Strategic Planning.

Details of the deliberation and decisions taken at the meeting are provided in the "Report of the Seventh Steering Committee Meeting".

Recommendations

The Steering Committee made the following recommendations:

1. In view of the outstanding performance of the extra-early maize varieties in the 1988 and 1989 regional trials, the Committee recommended that promising varieties in each country should be advanced into on-farm trials.

2. Considering the importance of Striga as a constraint to cereal production and the increasing interest on research to resolve this problem, it was recommended that the relevant International Centers (IITA and ICRISAT) should provide the lead in developing more precise system of scoring for symptoms of Striga damage.

3. While aiming at a single Maize Research Network for the sub-region of West and Central Africa, it was recommended that maize scientists from anglophone countries be accepted as full members of the CORAF Maize Network for the humid zone.

III. STRENGTHENING NATIONAL PROGRAMS

3.1. COLLABORATIVE RESEARCH

Collaborative research projects were implemented according to the research responsibilities assigned to the Lead Centers. Uniformly designed regional trials of improved maize varieties developed in the sub-region were conducted by all the Network member countries.

3.1.1. Technology Development by Lead Centers

CAMEROON

Development of early maturing varieties. The formation of early maturing maize populations was embarked upon using two approaches :

(i) Selection of early plants within adapted intermediate maturing varieties such as CMS 8503 (Pop 49 SR), CMS 8501 (Pop 49 x TZB-SR) and CMS 8704 (Suwan 1-SR), and

(ii) Variety crosses involving improved and local varieties viz : Suwan 1-SR x Local floury Bafia, DMR-ESR-W x Pop 49-SR, Suwan 1-SR x DMR-ESRY and Pop 49-SR x Extra-Early Kamandaogo Tollo.

A National Variety Trial of early maturing varieties was designed and conducted at many locations throughout the country, with emphasis on the drier northern parts. Pool 16 DR and DMR-ESRY were the highest yielding varieties across the locations.

Development of drought tolerant maize. Inbreeding was started in PooI 16 DR Co and Drought Resistant Synthetic (Ex-IITA) in order to form a drought tolerant pool. One hundred and sixty-three S_2 lines were advanced to S_3 under moisture stress. Selection was based on less wilting, good synchronization between silking and tasseling at a population density of 110.000 plants/ha. Selected lines will be evaluated in 1990 at Soucoundou and Maroua.

Development of Striga tolerant maize. Twenty-two inbred lines developed from Cameroon maize program germplasm were evaluated for Striga infestation. Six lines were identified as promising for the development of a Striga tolerant synthetic.

Effect of fertilizer on maize under different cropping systems : From results of trials conducted over several locations and years in the lowland savanna of Cameroon, there was a significant yield response to applied N in all cases, to P in some cases, and to K in one case. It was also established that maize usually performs better after groundnuts than after cotton ; therefore a cotton-groundnut-maize system was recommended to replace the current practice of groundnut-cotton-maize. Sulphur and magnesium were found to be deficient at several locations with predominantly sandy soils (Alfisols). Zinc deficiencies were also observed on maize grown in some farmers' fields, perhaps due to crop intensification and severe erosion problems.

Improvement of plant establishment and maize yield through seed treatment. Plots planted with seed treatments of Marshal 25 ST (Carbosulfan) and Furadan 10 G (Carbofuran) outyielded those of untreated plots or those treated with Thioral (25% TMTD and 25% heptachlore) or Mocap 10 G (Ethoprophos). The plants showed good

emergence, good seedling vigor and perfect stand compared to a reduction of 10-40% plant stand and subsequent yield loss in the check plots or those treated with Thioral or Mocap. This has been attributed to the effect of these chemicals on soil insects, especially termites. Response was shown to be greatest in years or locations with prolonged moisture stress. Marshal 25 ST was reported to seem more attractive than Furadan for the small farmers owing to reduced cost and ease of application.

Effect of graded steps of improved technologies on maize performance. In an experiment conducted in the Sudan savanna (Djalingo) to study the differential response of two improved maize varieties to different improved technological components when applied singly or in combinaison, there was a significant response to tillage, seed treatment and fertilizer. For both varieties, the best treatment resulted from a combination of factors. On an average, the contributions of the factors to total yield were as follows : 5% for tillage, 27% for seed treatment, and 38% for fertilization.

COTE D'IVOIRE

Local maize germplasm evaluation for early maize. One hundred and two maize accessions collected from the central region of Côte D'Ivoire, where farmers grow 90-day maize cultivars, were evaluated for twenty different agronomic characters. In addition to conserving these accessions, promising ones will be selected for the development of an early maturing maize population.

Stem borer resistance breeding. Three species of stem borers were identified in the central and northern parts of the country, namely Eldana saccharina, Sesamia calamistis, and Busseola fusca. Using insecticide control, the scientists established yield losses of up to 56.9 % to be attributable to stem borer damage on maize sown in June in the central-south of the country.

To facilitate uniform and reliable screening of germplasm for stem borer resistance, a mass rearing laboratory is under construction at Bouake. Order has been placed for equipment and materials for the laboratory.

TOGO

Development of streak resistant maize. Streak resistance screening facilities have been established at Ativeme near Lome, Togo. Over 24,000 Cicadulina leafhoppers can be raised per week in the screenhouse ; these are enough to infest about 5,000 plants.

Using the artificially raised Cicadulina leafhopper vector, the National Program evaluated 152 S_3 lines from AB12 (Togo local floury x Pop 49-SR) and 200 S_1 lines from AB13 (Togo local floury x Pop 43-SR) for resistance to maize streak virus. The resistant plants were advanced to the next generation of inbreeding.

Development of varieties of different maturities. The National Program organized two types of National Variety Trials : Late maturing and Early maturing trials. Although the improved varieties produced higher grain yields, farmers were said to appreciate the improved version of local varieties e.g. ZL2-BD because of the preferred grain type. This variety is being heavily used in the breeding program. The National Variety Trial revealed that there are some ecologies in the coastal south which have low rainfall and savanna-type vegetation and soils ; for example, Agbomedji which has 800mm annual rainfall. Yields in Agbomedji are 50-75% of yields in Davie. There is an intense maize culture around Agbomedji.

Six hundred and fifty S_4 families from AB21 population (ZL2-BD x Pool 16 SR BC_2) were evaluated for husk cover, soft endosperm, grain texture and prolificacy for the development of

early maturing varieties. Also, 600 S_1 families from ELE 2 population (TZESR-W x Gua 314) which had previously been subjected to irradiation were evaluated for prolificacy and extra-earliness. Selected families were advanced to S_2.

GHANA

Development varieties of different maturities. The maize program has five breeding populations each corresponding to one of the major varietal requirements of Ghana (full-season white, full-season yellow, intermediate white, early yellow and early white). Breeding pools which serve as germplasm reservoir for improving the full-season white and intermediate white have also been developed. Improvement in the streak resistance levels of each breeding population and pool was continued.

The streak resistance level in Dorke, an early maturing, white dent variety extracted from Pool 16 in Ghana was raised by artificially infesting 400 half-sib families with viruliferous leaf hoppers at IITA. This was made possible by the fact that Dr. Badu-Apraku, the National Maize Coordinator spent one year at IITA as a visiting national collaborating scientist. Similarly, the streak resistance level was raised in a high quality protein maize variety, EV 8363-SR BC_4. These two varieties will be available for testing in Ghana in 1990 and within the other Network countries in 1991.

National Varietal Trials were conducted at several locations. In the medium maturing variety trials, Abeleehi (IK 8149-SR) was the highest yielding with 6.30 t/ha compared to 5.54 t/ha for the local check. Results of the early-maturing variety trial revealed that DMR-ESRW was significantly superior to all the other varieties with a yield of 5.44 t/ha while the local check yielded 3.35 t/ha.

Study of inheritance of floury endosperm in local variety. Many local varieties in Ghana, Togo, Benin, Cameroon and Cross River State of Nigeria have a floury endosperm which is preferred for local dishes. During the year, Ghana initiated a study to investigate the inheritance of this local grain character and to determine whether the same gene(s) controls the inheritance of the floury grain type in the five countries.

BURKINA FASO

In collaboration with the National Program of Burkina Faso, the following activities were carried out by the Network Coordinator.

Development of drought resistant varieties. Pool 16 DR C3 was planted under streak pressure at IITA Ibadan to upgrade the level of resistance to streak virus disease. Similarly, the second recombination among the selected families to form the experimental varieties (Across Pool 16 DR, Farako-Bâ 88 Pool 16 DR (HD) and Kamboinse 88 Pool 16 DR) was also done under streak pressure utilizing only the streak resistant plants. Full-sib families were generated from the Cycle 3 at Kamboinse (Nov.89-March 90) for multi-location progeny trials in 5 countries in 1990 namely : Benin, Burkina Faso, Cameroon, Ghana and Senegal.

The F_2 families from the Drought Resistant Composite (Early) were advanced to F_3 under drought stress at Kamboinse during the July-October season. The F_3 families were thereafter subjected, as white and yellow groups, to drought and high temperature stresses using two levels of irrigation at Kamboinse during the November 89-March 1990 off-season. Bulk-sibbing was carried out among the selected families ; selfing was also done.

Extra-early maize. The extra-early maize populations --TZEE-W and TZEE-Y-- were improved for disease resistance in 1989. They were crossed with appropriate sources of streak resistance --EV 8430-SR and EV 8431-SR for TZEE-W and TZEE-Y, respectively. These were then planted at Farako-Bâ in the northern Guinea savanna under increased pressure of foliar fungal diseases (Helminthosporium maydis leaf blight and Curvularia leaf spot) enhanced by pre-planting a susceptible variety as disease spreader. The least susceptible plants (approximately 35%) were recombined by bulk-sibbing. Furthermore, the streak resistant versions were advanced to BC_1 F_1. During the July-November season, through supplemental irrigation at Kamboinse, they were advanced to F_2. The F_2 families were later sent to IITA for planting under streak pressure for advancement to BC_2 F_1.

Conversion of elite varieties to streak resistance. Three maize cultivars which are well appreciated for certain traits by farmers in the drier parts of the sub-region, were identified for conversion to streak resistant form. They are (i) Maka (Ex-Mauritania) known for earliness and drought tolerance, (ii) Blanc 2 Precoce (ex-Benin Republic) for earliness and consumer acceptability and CSP (identified from SAFGRAD regional trials) for earliness and yield stability. The F_1's had been advanced to BC_1 F_2. The IITA Maize Program at Ibadan is providing back-up support for streak resistant evaluation and advancement fo BC_2 F_1.

3.1.2. Regional Variety Trials

The objectives of the Regional Uniform Variety Trials are :

(i) to provide a forum for national program scientists to test their nationally proven elite maize varieties region-wide and at the same time expose them to other national programs addressing similar ecologies, and

(ii) to promote exchange of improved germplasm within the sub-region.

Three types of regional uniform variety trials (RUVT) were offered to the network member countries in 1989 namely :

RUVT-1 : Early maturing, drought resistant/tolerant varieties,

RUVT-2 : Intermediate/late maturing varieties, and

RUVT-3 : Extra-early maturing varieties.

The trials comprised varieties developed by Cameroon, Ghana, Togo and IITA.

Eighty-four sets of the trials (RUVT-1 : 31 ; RUVT-2 : 23 ; and RUVT-3 : 30) were requested by 15 countries (Table 1). As at 28 February 1990, results were received for 54 sets planted in 10 countries. Data from all the trials were analysed and compiled. Copies of this 1989 RUVT Data Compilation document have been distributed to all the collaborating countries.

Generally, the cropping season was satisfactory with regards to rainfall distribution in the sub-region. Plant establishment was excellent. The quality of the trials as measured by the magnitude of the coefficient of variation was reasonable but can still be improved upon. About 80% of the trials had CV values of 30% or less but only 50% of the trials were with CV's of 20% or less.

RUVT-1

Across-location analysis revealed that all the varieties were higher yielding and yet earlier maturing than the local checks. TZE Comp. 3 x 4 F3, Farako-Bâ 86 Pool 16 DR (HD) and DMR-ESRY were among the best performing varieties with average yields of over 4 t/ha.

Table 1. Number of sets of Regional Uniform Variety (Maize) Trials (RUVT) requested per country, 1989.

Country	Number of sets requested			Total
	RUVT-1	RUVT-2	RUVT-3	
Benin	4	2	3	9
Burkina Faso	2	2	3	7
Cameroon	3	2	3	8
Cape Verde	-	-	1	1
Central African Republic	2	1	1	4
Côte d'Ivoire	2	2	2	6
Gambia	2	-	2	4
Ghana	2	2	1	5
Guinea Bissau	2	1	2	5
Guinea Conakry	2	4	2	8
Mali	1	-	2	3
Mauritania	1	-	1	2
Niger	1	1	1	3
Nigeria	1	1	1	3
Senegal	3	3	2	8
Tchad	1	0	1	2
Togo	2	2	2	6
T O T A L	31	23	30	84

RUVT-2

On the average, the late/intermediate varieties flowered about 8 days later than the early maturing varieties and reached maturity 20-30 days later. Yields were, of course, higher by about 34 %. The varieties Ndock 8701 and CMS 8710 from Cameroon and Okomasa from Ghana were among the top yielding varieties with average yields of 5.53, 5.47 and 5.22 t/ha, respectively. The remarkably good performance of the entries included as local check showed that most national programs now have available satisfactorily high yielding late/intermediate maturing varieties at or near extension stage.

RUVT-3

The extra-early varieties represented new technologies in the sub-region. Many of them flowered less than 45 days after planting and yet produced yields of over 3.0 t/ha. Some were ready for green maize harvest 2 months after planting. The plants were short with an average height of 1.42 m compared to 1.60 m and 1.96 m for early and late maturing varieties, respectively. At locations with hydromorphic soils (vertisols), many of the extra-early varieties produced yields of 5-7 t/ha at the recommended plant density of 66,500 plants/ha (75 x 20 cm). They are therefore potentially useful as a relay crop in lowland rice ecologies. A survey of the trials across the sub-region showed that for good performance, top-dressing with Nitrogen fertilizer should be carried out earlier than is the practice for late maturing varieties.

The Network sponsored several activities to improve the capability of National Programs for effective research into increased maize productivity in the sub-region. These included technical visits of the Coordinator and some members of the Steering Committee ; training of technicians ; and provision of funds and seeds of improved varieties.

3.2. VISITS TO NATIONAL PROGRAMS

3.2.1. Visits by Network Coordinator

The Coordinator, Dr. J.M. Fajemisin, visited the following network-member countries during the 1989 cropping season : Mali (15-19 July), Côte d'Ivoire (26 July-1 August), Tchad (9-12 August), Cameroon (3-14 August), Guinea-Bissau (18-22 Septembre), The Gambia (23-26 September), Senegal (26-30 September), Benin (4-7 October) and Togo (9-11 October). The objectives of the visits were (i) to assess the activities of the various national programs and increase the effectiveness of their participation in the Network, (ii) to assess training needs in order to promote the development of effective and sustainable national maize programs, (iii) to find out how maize is utilized locally and, where necessary, advise on how to increase consumption/utilization and thus enhance farmers' incentive to produce maize and (iv) to promote interaction between maize research institutions and development agencies including small scale farmers for realistic conception and implementation of research goals and procedure. Details of the Coordinator's activities and findings during the trips are provided in the Trip Report.

It was evident in the course of the visits that the increasing importance of maize across the semi-arid zone of West and Central Africa was consistent from Cameroon in the eastern limit of the sub-region to Senegal in the Western limit. But ironically, almost all the countries visited did not have the basic minimum trained researchers to respond to this challenge.

It is, however, remarkable that every national program was making effort to collect, characterize and conserve the maize landraces (local ecotypes) within each country. It was clear that technical assistance was needed in addressing this issue particularly in the design of standard techniques for germplasm

collection and characterization. Also, germplasm storage implies some basic infrastructure for which many national programs lack funds for their installation and for operational expenses. It was pleasing to note the close relationship and/or integration between maize research program and the seed production agencies in the countries visited. This promoted feedback and the mutual enthusiasm influenced development as reflected by the increased maize hectarage.

The Lead Centers have made progress in implementing research projects on resolving the regionally-common problems allocated to them. The establishment of the streak screening facilities in Togo, for instance, demonstrated the feasibility of this technology originally developed at an international center (IITA) and the capability of the NARS scientists to successfully execute adaptive research which will, hopefully, evolve into basic research appropriate to the needs and circumstances of the individual countries.

3.2.2. Visits by Members of the Steering Committee

In pursuance of the goal of developing sustained leadership of the network by NARS scientists, the Steering Committee in 1988 started to assign some of its members to visit certain national programs. The objectives were (i) to familiarize the visiting scientist with the maize research and production activities of the respective countries, (ii) to share their experience with the scientists of the host countries, and (iii) to promote exchange of technologies, ideas and visits among national scientists in the sub-region.

The same countries visited in 1988 were selected for visits in 1989 and as much as possible by the same Steering Committee members. This was to enable them to follow-up on their previous observations and to consolidate gains and confidence. Dr. Charles

Thé of Cameroon visited Central African Republic ; Mr. Attiey Koffi of Côte D'Ivoire visited Cape Verde and Dr. Esseh-Yovo Mawule of Togo went to Senegal.

The various visits revealed that technologies generated in the Network were gradually diffusing among the different countries. For example, CMS 8602, a variety extended in Cameroon was being utilized by the scientists in the neighbouring country of Tchad. Also, the tied versus simple ridges system developed in Burkina Faso to induce two levels of moisture stress for drought tolerance work has been adopted by the Cameroon Program.

Some maize varieties developed or promoted through regional trials by the Network are being grown by farmers in the following countries :

Benin	:	DMR-ESRW, TZB
Burkina Faso	:	KPB (EV 8430-SR), KPJ (EV 8431-SR), EV 8422-SR)
Cameroon	:	CMS 8806 (DMR-ESRY), CMS 8602 (EV 8431-SR)
Ghana	:	SAFITA-2, Dorke (Pool 16 SR)
Tchad	:	TZESR-W
Togo	:	Ikenne 8149-SR.

For some other countries or varieties, the adoption process has reached the on-farm verification stage. At the same time, the national programs continue to request from the Network Coordinator seed of varieties identified promising for use in their breeding programs. Among the materials frequently demanded are Pool 16 DR, DMR-ESRW and DMR-ESRY.

3.3. TRAINING

Inadequacy of appropriately trained technicians is among the critical problems of maize research in all the Maize Network member countries. This imposes severe limitation on the quantity and quality of work by the national Programs.

It is to resolve this problem that a practical-oriented 5-month course was commenced in 1988 by the Network for technicians from Benin, Burkina Faso, Central African Republic, Guinea, Mali and Tchad. In 1989, another group of technicians was invited, one each, from Central African Republic, Cape Verde, Ghana, Guinea Bissau, Senegal and Tchad. Nominations were received from all, except Senegal, and tickets were forwarded. Unfortunately, only Ghana, Guinea-Bissau and Tchad sent in participants in spite of several efforts made by the Network Coordinator to ensure participation.

The training, which started on 18 June and ended 25 November emphasized management of field experiments, varietal maintenance, seed production, agronomic practices including tied-ridging as a method of water conservation in semi-arid zone, data processing and interpretation of results. Each trainee managed an experiment from planting to harvesting, data collection, and interpretation and also wrote a report of his activities. The course also provided a forum for interaction and strengthening regional collaboration.

The Coordinators of the Maize and Cowpea Networks assisted in planning and implementing a 2-week in-country course on "Maize and Cowpea within appropriate farming system" jointly organized by IITA and INERA at Saria, Burkina Faso. Twenty-five field workers (technicians and field assistants) from research and development organizations all over the country participated at the course.

3.4. FINANCIAL ASSISTANCE TO NATIONAL PROGRAMS

Both the Lead Centers and some of the other National Programs were provided some financial assistance to enhance their effectiveness in Network activities. Of course, this supplements rather than replaces the national budgetary allocations to the respective countries. Details of the disbursement are given below:

1989 Allocation and disbursement of funds to Maize Network member-countries (francs CFA)

Countries	Amount allocated	Disbursement* 1st Instalment	2nd Instalment
Benin	1.200.000	600.000	600.000
Burkina Faso	1.100.000	500.000	-
Cameroon	900.000	450.000	450.000
Côte D'Ivoire	900.000	450.000	-
Mali	900.000	450.000	450.000
Senegal	900.000	450.000	540.000
Togo	900.000	450.000	-

* To ensure accountability, the second instalment is paid only if the first instalment is justified by the submission of appropriate receipts.

3.5. TECHNICAL BACKSTOPPING BY IITA

Apart from representation at the Steering Committee meetings, IITA backstopped the Maize Network through several activities.

Drs. S.K. Kim (Maize Breeder), and Nilsa Bosque-Perez (Maize Entomologist) paid visits to Cameroon to provide technical advices whilst Drs. J.H. Mareck and Weber visited Benin. Also, Dr. G. Weber joined Dr. Esseh-Yovo Mawule (Chairman, Steering Committee) and the Network Coordinator in visits to Senegal. IITA

awarded Dr. B. Badu-Apraku of Ghana a one-year collaborating visiting national scientist position during which he interacted with IITA scientists and the Nigerian Maize Program scientists and also visited the Cameroon Maize Program. Apart from providing seed of improves germplasm, IITA also assisted in providing facilities for the improvement of the streak resistance level of some of the varieties and advanced germplasm types being worked on by the Network. Training materials were also provided by both the Training and Maize Research Programs.

IV. HARMONIZATION OF ACTIVITIES OF SAFGRAD AND CORAF MAIZE NETWORKS

It is clear that both the SAFGRAD and CORAF maize networks are run largely by the same scientists in the sub-region. This imposes some limitation on the time of these scientists and calls for harmonization of the activities of both networks. Such harmonization would demand genuine technical and political considerations aimed at effective utilization of the limited manpower and financial resources to the benefits of the farmers in the region.

COWPEA NETWORK ANNUAL REPORT 1989/90
(RENACO)

I. COLLABORATING NATIONAL PROGRAMS AND NATIONAL COWPEA COORDINATORS

1.1. LEAD CENTERS

Five national programs were assigned by the Steering Committee the responsibility of conducting technology development research activities of interest to themselves and to the network.

1. Burkina Faso
   - Research responsibilities : Breeding for drought, *Striga*, insect pests and disease resistance, Entomology, Pathology.
   - National Coordinator :
     . Dr. Dabire Clementine (Entomologist)
     INERA, 03 B.P. 476
     Ouagadougou.

2. Cameroon
   - Research activities: Entomology with particular emphasis on storage insect pests control.
   - National Coordinator :
     . Mr. Ntoukam Georges (Entomologist)
     IRA, B.P. 33, Maroua.

3. Niger
   - Research responsibilities : Breeding for drought, *Striga*, insect pests and disease resistance, Agronomy, Pathology, including *Striga*.
   - National Coordinator :
     . Mr. Moutari Adamou
     Breeder, INRAN
     B.P. 429, Niamey

4. Nigeria

- Research responsibilities : Breeding for drought, Striga, insect pests and disease resistance, Agronomy, Pathology, Entomology.
- National Coordinator :
  - Dr. O.O. Olufajo
    Agronomist
    Department of Agronomy
    IAR/ABU, PMB 1044, Zaria

5. Senegal

- Research responsibilities : Breeding for drought, insect pests and disease resistance, Entomology.
- National Coordinator :
  - Mr. Ndiaga Cissé
    ISRA/CNRA
    B.P. 53 - Bambey

1.2. TECHNOLOGY ADOPTING CENTERS

Benin : Dr. Jean Detongnon
Cowpea Breeder , SRCV-Niaouli
B.P. 3, Attogon

Cape Verde : Mr. C.E.P. Silva
Agronomist, INIA/MDRP
B.P. 50 , Praia

Côte d'Ivoire: Mr. Adou Amalaman
Institut des Savanes
B.P. 121, Ferkessedougou

The Gambia : Mr. Bojang Musa
Dept. of Agricultural
Research
Yundum Western Division

Ghana	:	Mr. Atuahene-Amankwa Cowpea Breeder, Crops Research Institute P.O. Box 3785, Kumasi
Guinea Bissau:		Mr. Abu Biai M.D.R.E. Agricultural C.P. 71, Bissau-DEPA/CENEMAC Contuboel
Guinea Conakry:		Dr. F.L. Guilavogui Cowpea Entomologist Ministère de l'Education Nationale IRAG, B.P. 1003, Conakry
Mali	:	Mr. Kodio Ondie Cowpea Breeder, IER/DRA/SRCVO B.P. 438, Bamako
Mauritania	:	Mr. Sidi R'Chid Breeder, CNRADA B.P. 22, Kaedi
Togo	:	Mrs. Akossiwa Duyiboe Cowpea Agronomist DRA, B.P. 2318, Lome

II. MANAGEMENT OF THE COWPEA NETWORK

The sixth and seventh meetings of the Steering Committee were held between April 1, 1989 and March 31, 1990.

2.1. THE SIXTH STEERING COMMITTEE MEETING

The above-cited Steering Committee meeting was held at Ouagadougou, Burkina Faso, November 6-10, 1989.

(a) In attendence were:

Members of the Steering Committee:

Dr. J. Detongnon (Benin) --Chairman
Mr. Ndiaga Cisse (Senegal) --French Secretary
Dr. O.O. Olufajo (Nigeria) --English Secretary
Dr. C. Dabire (Burkina Faso)
Mr. G.A. Amankwa (Ghana)
Mr. G. Ntoukam (Cameroon)
Dr. N. Muleba --Network Coordinator

Observers and resource persons

Dr. T. Bezuneh (Director of Research, SAFGRAD).
Dr. G. Kingma (Snr. Tech. Advisor, SAFGRAD-USAID/BF).
Dr. J. Sentz (USAID-IITA Liaison Officer).
Dr. S.R. Singh (Director GLIP, IITA).
Dr. B. Ntare, (Cowpea Breeder, IITA-ICRISAT, Niamey).
Dr. J.M. Menyonga (International Coordinator, SAFGRAD.

(b) Agenda of the meeting

The following RENACO activities were discussed:

1) Cowpea network workshop held at Lome, 20-24 March 1989.

2) The 1989 mid-term RENACO activity report including reports from Burkina Faso, Cameroon, Niger, Nigeria, and Senegal.

3) Visit of the Network Coordinator to national programs of Cameroon, Benin, Côte d'Ivoire, Ghana, Guinea Bissau, Mali and Togo.

4) RENACO group training of national scientists on "Appropriate technology development and transfer".

5) IITA-GLIP strategy to better serve national cowpea programs.

6) Planning of RENACO training activities for the 1990-91 season.

7) Funding of collaborative research activities.

8) Network strategic plan (This activity was guided by the Director of Research, SAFGRAD).

9) Miscellaneous

The results of the deliberation, decisions taken and recommendations made for implementation by the Network Coordinator are reported in the "Sixth Steering Committee meeting report".

(c) Highlights of the deliberation

With the renewed efforts by IITA-GLIP in its strategic plan to better serve national programs for the enhancement of cowpea research and production in West and Central Africa, members of the Steering Committee of the Cowpea Network and national scientists have been involved in planning and evaluating the different stages of IITA-GLIP research activities.

Periodic visits of national scientists to IITA outreach stations to allow them to interact with their colleagues working at these stations with the view of sharing experiences and technology development methodologies is also envisaged. This activity will, hopefully, accelerate the development of appropriate technologies that will ensure increased and sustainable crop productivity and production by peasant farmers in the sub-region.

(d) Recommendations

The Cowpea Research Network Steering Committee made the following recommendations :

1. The Committee noted with interest that the network has made some remarkable contributions in the area of technology development and adoption of research results by farmers. It is recommended that an appropriate mechanism should be worked out for evaluation of the network.

2. The Committee observed that the Coordinator may not be be able to visit all member countries at appropriate times during the growing season. It is recommended that members of the Steering Committee could visit some of the countries on behalf of RENACO.

3. The Committee recognizing the fact that SPAAR alone may not be in a position to provide the needed funds, wish to reemphasize that the International Coordinator of SAFGRAD should make direct efforts to look for funds from other sources. It is also recommended that member countries should look for funds through bilateral collaboration.

2.2. THE SEVENTH STEERING COMMITTEE MEETING

The seventh Steering Committee meeting was held at Ouagadougou, Burkina Faso, March 26-30, 1990.

(a) Attendance:

Present at this meeting were members of the Steering Committee as below:

Dr. J. Detongnon (Benin) --Chairman
Dr. O.O. Olufajo (Nigeria) --English Secretary
Mr. G. Ntoukam (Cameroon) --Ag. French Secretary
Mrs. C. Dabire (Burkina Faso)
Dr. N. Muleba --Network Coordinator

Two members, namely Mr. G.A. Amankwa of Ghana and Mr. C. Ndiaga of Senegal were absent with apologies.

Also present at the meeting were observers and resource persons.

Dr. T. Bezuneh (Director of Research, SAFGRAD)
Dr. G. Kingma (Snr. Tech. Advisor, SCO-USAID/BF)
Dr. G. Myers (IITA-GLIP, Ibadan)
Dr. J.M. Menyonga (International Coordinator, SAFGRAD)

(b) Agenda of the Meeting

1) General Matters:

- Election of the Chairman and Secretaries of the Steering Committee for the 1990-91 period.
- Adoption of the proceedings of the 6th Cowpea Steering Committee meeting of November, 1989.
- Matters arising from the minutes of the sixth Steering Committee meeting : CRSP activities, Evaluation of the Networks, and Supplementary budget proposal.

2) RENACO Activities

(i) Review of the 1989 Annual Progress Report of RENACO Lead Centers : Burkina Faso, Cameroon, Nigeria, and Senegal.

(ii) Review of research workplans of RENACO Lead Centers for 1990 : Burkina Faso, Cameroon, Nigeria, and Senegal.

(iii) 1989-90 Regional Trials: Progress Report.

(iv) Planned activities for strengthening national programs.

- 1990 Cowpea Monitoring Tour.
- 1990 IITA-GLIP Field Days in Niamey, Niger and IITA- GLIP, Kano, Nigeria.
- 1991 Joint Seminar for Maize, Cowpea, Sorghum and Millet research agronomists.
- March 1991 Joint Maize/Cowpea workshop.
- SAFGRAD III Strategic Planning.
- 1990 visits to national programs.

3). Miscellaneous

- March 1990 Workshop organized at Ibadan, Nigeria, by IITA-ICP for On-farm testing sponsored by EEC.

- March 1990 IITA-GLIP Annual Research Review held at Ibadan, Nigeria.

- March 1990 IITA/FAO Workshop on Striga control held at Ibadan, Nigeria, under FAO sponsorship.

- IITA-GLIP Field Day visit at Minjibir, Nigeria in September 1989.

- IITA-GLIP Field Day visit at Niamey, Niger, in September 1989.

- Progress on publication of proceedings:

  * 1988 Seminar for Scientists from RENACO Lead Centers.
  * 1989 Joint Maize-Cowpea Workshop
  * 1989 Training Course for Scientists from technology adopting Centers.

- Disbursement of funds allocated to national programs in support of cowpea research.

- Funds to be allocated in 1990 in support of cowpea research.

Details of the deliberation and the recommendations made for implementation by the Network Coordinator are presented in the "Seventh Steering Committee Meeting's report".

(c) Highlights of the deliberation

The Committee expressed satisfaction about work carried out by Lead Centers and urged them to continue in that direction which will provide rapid solutions to production constraints.

Commenting on the work done on the control of scab and Septoria leaf spot, the Committee was of the opinion that there is still a lot more to be done in this area and recommended that large screening of available germplasm be pursued for additional sources of resistance by IITA-GLIP and RENACO Lead Centers.

Similarly the Committee felt it was imperative to offer training courses to national scientists in the use of Micro Computer Programs in analysing data to alleviate their heavy burden.

(d) Recommendations

The Cowpea Research Network Steering Committee made the following recommendations.

1. The Committee noted the strong need for training in the use of computer. It is recommended that a training in the use of computer be planned for 1991. It is also recommended that the International Coordinator of SAFGRAD should follow up the suggestions by the Deputy Director of CRSP regarding funding a computerization program for SAFGRAD and training of NARS scientists.

2. The Committee observed that a lot of work still needs to be done on the control of scab and Septoria leaf spot. It is, therefore, recommended that extensive screening of available germplasm

be pursued by IITA and the Lead Centers to find additional sources of resistance. It is also recommended that cowpea pathologists in the subregion should work together on collaborative projects.

3. In recognition of the fact that the Steering Committee meeting holding in March is always crucial for planning research activities for a particular year, the Committee strongly recommends that the March meetings be attended by scientists from the outreach stations of IITA/GLIP in Niamey (Niger) and Kano (Nigeria).

III. STRENGTHENNING NATIONAL PROGRAMS

Efforts made to strengthen the capacity of national programs involved the following activities.

3.1. COLLABORATIVE RESEARCH

Collaborative research activities in 1989 were carried out by RENACO Lead Centers according to the research responsibilities assigned to them by the Steering Committee. With the exception of Niger, all the other Lead Centers had reported on their 1989 research findings during the Seventh Meeting of the Steering Committee at Ouagadougou, Burkina Faso, March 26-30, 1990 as follows:

BURKINA FASO

The national cowpea program of Burkina Faso conducted research in the area of breeding, entomology and pathology.

a) Breeding

Adaptation trials: The objective of the above trials was to identify lines, cultivars and/or varieties adapted to drought. The trials were conducted in two ecologies of the semi-arid zone of Burkina Faso, using at least two sowing dates. The latest sowing date was chosen, based on a 20-year average rainfall distribution (1961-1981) data, to receive a minimum of a 40 days of effective rain and be exposed to hot and dry spells during generative growth stages in each ecology. The trials conducted included the followings :

. Adaptation to northern Guinea savanna zone. Cercospora leaf spot, aphid borne mosaic virus, scab, web blight, and brown blotch diseases caused severe yield damage. The varieties KVx396-4-2 and KVx396-4-5 gave the highest yields and showed tolerance to the diseases. IT86D-1056, KN-1 and Logofrousso-2 appeared to tolerate Cercospora leaf spot disease whilst KN-1, KVx396-4-4 and KVx396-18 seemed resistant to brown blotch disease.

. Adaptation to Sudan Savanna Zone. Entries did not differ statistically in yield. The best performance of IT85D-3516-2 was observed and will be confirmed in 1990 season.

b) Entomology

Aphids, thrips and pod sucking bugs are major constraints to cowpea production. They must be effectively controlled in order to obtain significant cowpea yield.

Effect of plant population on cowpea insect pests incidence and cowpea yield. Under no insecticide spray, incidence of aphids, thrips and pod sucking bugs reduced as plant population density was reduced from 66,500 pl/ha(75 x 25 cm) to 4,444 pl/ha (100 x 225 cm).. This resulted in high number of flowers and high yield for the lowest density. The local variety performed better than the two improved varieties.

Screening for Aphids resistance. Ten lines introduced from IITA were evaluated in the screenhouse for aphid resistance.Sixty days after sowing, line IT87S-1459 was highly resistant, and IT82E-25 had good level of resistance whereas IT87S-1390 and IT87S-1394 were tolerant.

A field adaptation trial in the Sudan savanna zone showed cultivars IT82E-25, IT87S-1390, IT84S-2246 and IT85D-3577 to be high yielders, but they were not statistically different from the check, KN-1 (Vita-7). They showed remarkable resistance to bacterial blight diseases.

Screening for bruchid resistance. Several lines and cultivars were evaluated in the laboratory for bruchid resistance at pod as well as at grain stages. Lines KN-1, KVx396-16-12, IT87D-849 and B301 had good resistance at the pod stage whereas IT86D-498, IT84S-2246, IT87D-1827 and IT86D-560 showed good resistance to bruchids at the grain stage only.

A field adaptation trial in the Sudan savanna zone showed cultivars IT86D-713, IT86D-1038 and KXx396-16-12 to be high yielders ; but they were not statistically different from the check KN-1.

Screening of Insecticides. Eleven insecticides were screened for their effectivess in field insect pest control. The synthetic pyrethrinoides, Decis and Karate or their mixture with Dimethoate (an organophosphorous) were found to be effective in controlling thrips, Maruca and pod sucking bugs. They are safe and cheap.

e) Striga resistance studies

Striga gesneroides is a parasitic weed that constitutes, beside drought and insect pests, a major constraint to cowpea production in the Sahel and Sudan savanna zones. Following studies were conducted during the 1990 cropping season.

Assessment of yield losses caused by Striga infestation. Sixteen varieties of varying Striga resistance characteristics were evaluated in Striga sick plots and non infested plots at Kamboinse and Fada N'gourma. The objective of the trial was to assess seed yield losses due to Striga infestation. Average yield losses of 52 % and 34 % were observed at Kamboinse and Fada N'Gourma, respectively. In as much as Striga resistant cultivars experienced significant and severe yield losses at Kamboinse only, part of the yield losses at this location could be attributed to soil fertility differences between the two plots. This will be further investigated.

Yield trial of Striga resistant lines introduced from IITA. Sixteen lines and cultivars introduced from IITA-Ibadan were field tested in a Striga sick plot at Kamboinse. In addition to IT82D-849 and B301, two other entries (IT81D-994 and IT87S-1463) were free of Striga infestation, but not outstanding yield wise. IT86D-843, IT87F-1728-4 and IT87S-1462 had high level of Striga resistance and satisfactory yielding ability; IT86D-957 was moderately tolerant to Striga.

Adaptation of F-8 lines combining resistance to aphids, bruchids and Striga. Two hundred and seventy-seven lines were studied for adaptation to the Sudan Savanna zone. Fifteen lines were selected for good performance across sowing dates. They appeared to be resistant to the prevailing diseases. They will be screened for Striga resistance in pots and in the field during the 1990 season.

Adaptation of F-6 lines extracted from Striga resistant populations involving B301 crosses. Two hundred and eighty-eight lines were studied for adaptation to the Sudan savanna and the Sahelian zones. Twenty-three lines of good performance across sowing dates and locations with good resistance to prevailing diseases were selected. They will be screened for Striga resistance in pots and in the field during the 1990 season.

CAMEROON

The national cowpea program of Cameroon conducted research in the areas of Storage and Varietal Yield Trial.

a) Storage

Cowpea experiences severe grain losses during storage. Losses can be as high as 50% three months after harvest. This calls for serious work for better storage methods that are acceptable to peasant farmers.

Use of solar radiation to control bruchids infestation. It was found that use of clear plastic covers on top of black plastic laid down over an insulating cushion made of cowpea pod husks or any other dry plant material permitted the temperature to rise to a lethal level of about 65°C within the plastics in December

which is a very cool month. Two hours under such temperature resulted in 0% bruchid infestation as compared to 77% in the check. The solar radiation treatment did not show any significant reduction in seed germination.

Use of ash to control bruchids in cowpea grain. The use of ash in stored cowpea grain was effective in controlling bruchids growth and development. However, the optimum ash/cowpea ratio was still to be determined before extending this practice to farmers.

Use of botanical products to control bruchids infestation in stored cowpea grain. Eleven treatments of botanical products of the neem plant : powder made from roots, leaves or flowers, neem seed oil, sheabutter and ash were studied for their effect on stored cowpea. Neem seed oil appeared to be effective in controlling cowpea grain against bruchids even at a low concentration. However, the duration of its effectiveness is still to be determined.

Use of sealed containers/drums in cowpea grain storage. This study was conducted in collaboration with peasant farmers. No life bruchid insect was found after 8 months of storage, although one farmer did not find the same results. The study will therefore be repeated in the 1990 season.

Use of double bagging in cowpea grain storage. No live bruchid was found in cowpea stored in double plastic bags after four months of storage regardless of whether the experiment was started with treated or non-treated grain. A loss of 34% in weight and 36 live bruchids per kilogramme of cowpea was observed for the non-treated check. Double bagging, therefore, appears to be most effective in controlling bruchids. In principle, the use of old air-tight fertilizer bags with clean plastic interior lining should ensure good cowpea storage.

b) Study of resistance to Callosobruchus maculatus in cowpea stored in pods.

Pre-establishment Larval Mortality (PLM) was taken into consideration and ranged from 58% to 99%. Cultivars VYA and IT83D-699 with a PLM value of 80% and 83%, respectively, suffered heavy losses caused by bruchids over the storage season regardless of whether or not grains were stored in pod form. A PLM value of at least 90% or even higher is required in order to confer biologically significant level of pod resistance.Lines with either pod or seed resistance or both were identified. Ten lines combined pod and seed resistance with a PLM value greater than 95%. The following attributes suspected to be involved in pod and seed resistance were studied : pod breakage index, pod thickness, seed coat texture and pod/seed ratio.

Although reasonably low and significant correlation coefficients were observed, they only accounted for less that 20% of the total variation observed. It is, therefore, necessary to have cowpea cultivars and lines screened for bruchid resistance in order to ascertain their most effective method of storability.

c) Yield trials

Early maturing cowpea trial. Cultivars IT86D-1010 and IT82E-32 had high yield, good fodder yield and resistance to cowpea aphid borne mosaic virus (CAbMV).

Medium maturing cowpea trial. Cultivar IT86D-719 appeared to have good virus and disease resistance, good pod set and high fodder yield, whereas IT86D-535 had high grain yield.

Bruchid resistance cowpea trial. IT86D-364, IT86D-560 and IT87S-1393 were promising lines.

Aphids resistance cowpea trial. IT85D-3577, IT86D-444 and IT82E-25 were found promising.

Regional SAFGRAD-RENACO Cowpea trial. KVx396-18-10 and IT85D-3517-2 appeared promising.

NIGER

The national cowpea program of Niger did not submit its 1989 annual report to the RENACO Coordinator as of March 1990.

NIGERIA

The national cowpea program of Nigeria conducted cowpea research in areas of breeding, agronomy, entomology and pathology.

a) Breeding

The following trials were conducted:

Preliminary cowpea yield trial. Sixty lines were observed in an un-replicated trial at Kadawa and Samaru.

Advanced cowpea yield trial. The trial was conducted at Kadawa, Minjibir and Samaru. Lines 48-8, 48-11, 48-37 and 48-21 appeared very promising at all the three locations.

Dual purpose cowpea trial. Ten lines were tested at Minjibir and Samaru for grain and fodder yields. Lines 7/180-4-5B, 4/48-15-1 and 2/180-4-9 were found promising at both locations.

Striga resistance trial. Seventeen cultivars introduced from RENACO were tested in Striga sick plots at Malammaduri, Sada and Tomas. At Malammaduri, Striga shoots emerged in plots of all tested cowpea cultivars; however, the Striga density was low in B301, IT82D-849 and SUVITA-2 plots as compared to TN88-63, Vita-5 and IAR-48. At Sada and Tomas, no Striga shoots emerged in the plots of B301 and IT82D-849. The number of Striga shoots in SUVITA-2 plots was less than those of the susceptible checks, TN88-63, Vita-5 and IAR-48. B301 was the second highest yielding cultivar at Sada and Tomas, whereas IT82D-849 was not outstanding yield-wise at any of the locations. TN88-63, in spite of its heavy Striga infestation was either the highest or among the highest yielding cultivars at all the three locations, this suggests tolerance to Striga infestation.

On-farm testing. Promising advanced lines were tested for their adaptation at several locations in state farms, namely: Daudauwa, Deba, Keffi, Ladanawa, Lafia, Mangu, Missau, Mingi, Tumu and Yelewa. Results from five locations showed Sampea-7, 11/48-2 and 19/48-18 to be very promising.

Multilocation variety trials. Ten short and eighteen medium duration cowpea cultivars and nine vegetable cowpea cultivars were tested in northern Nigeria as part of All-Nigeria coordinated cowpea research program.

The promising lines were as follows : short duration trial : H64-3, IT84S-2137, IT86D-719 and IT86D-1010 ; medium duration trial : H113-4, IAR48, IT86D-715 and K-39 ; vegetable cowpea trial : IT83S-898, IT86F-1024-1, IT83D-911 and IT84S-116.

SAFGRAD-RENACO Regional Cowpea Trials. Three trials were conducted and results obtained are reported as follows:

* Adaptation trial for the northern Guinea savanna conducted at Samaru. Lines KVx396-4-4, KVx396-4-2, KVx396-4-5 and KVx396-18 were very promising for yield, seed colour, and seed texture.

* Adaptation trial for the Sudan savanna zone conducted at Minjibir. The trial plot was heavily infested with Striga. Line KVx396-18-10 and cultivar TN88-63 gave the highest grain yields. Since they were also heavily infested with Striga, they appear to tolerate Striga infestation.

* Striga resistance trial conducted at Minjibir in Striga sick plot. Cultivars B301 and IT82D-849 and line TN121-80 and to some extent TN93-80 were free from Striga infestation. However, with the exception of TN121-80, together with KVx396-8-5 and KVx396-4-4-4 which produced the highest yields, the Striga resistant cultivars, B 301 and IT82D-849 together with the susceptible check, IT82D-849, were the lowest yielders. Cultivars KVx396-8-5 and KVx396-4-4-4 appear, thus, to tolerate Striga infestation.

b) Agronomy

The following trials were conducted:

Response of cowpea cultivars to four levels of phosphorus fertilizer. Four cultivars, IAR11/48-2, Sampea-7, IAR-178B and Kano 1696 were tested at four levels of P_2O_5 (0, 20, 40 and 80 kg/ha). Though grain yield increased with levels of P_2O_5 up to 60 kg/ha, the differences among treatment means were not statistically significant. Cultivar Sampea-7 significantly outyielded on the average, other cultivars.

Effects of rate and time of nitrogen application on cowpea grain yield. Cultivar Sampea-7 was tested using four levels of N fertilizers, (0, 20, 40 and 60 kg of N/ha) and three times of application. Neither the rate nor time of N application and their interaction had a significant effect on cowpea grain yield.

Effects of different rates of Nitrogen and phosphorous fertilizer on cowpea yield. Cultivar Sampea-7 was tested at three levels of phosphorous (0, 13, 26 kg P/ha) and four levels of nitrogen (0, 10, 20, 40, kg N/ha). Neither N rate nor P rate and their interaction had a significant effect on cowpea yield.

Effect of plant population on cowpea yield. Three cultivars, IAR 11/48-2, Kano 1696 and Sampea-7 were tested using four plant populations (20, 40, 60 , 80 and 100 thousand plants/ha). Apart from 80 as compared to 60 and 40 thousand plants/ha, cowpea seed yield increased significantly and reached a maximum of 100 thousand plants/ha. Cultivar Kano 1696 outyielded the three other cultivars.

Effect of sowing date on cowpea yield. Four cultivars (Sampea-7, Kano 1696, IAR-176B and IAR-335) were tested at three sowing dates (15/6/89, 15/7/89 and 15/8/89) at Samaru. Apart from the significantly reduced germination percentage of the 15 August sowing date, sowing date did not have any marked effect on number of days from sowing to flowering and maturity. Cultivar Kano 1696 and IAR-335 germinated poorly as compared to the two others at the 15 June sowing date. Kano 1696 flowered and matured latest. With regard to grain yield, only Sampea-7 which was the highest yielding cultivar , produced maximum yield at the 15 July sowing date. Kano 1696 produced no grain yield at any of the sowing date, probably because of its lateness. No cultivar produced grain yield at the 15 August sowing date.

Herbicide evaluation for weed control in cowpea. Twenty-two herbicide treatments (including pre-emergence and post emergence) were compared with hand hoeing and unweeded checks. Common weed species at the sites were Brachiaria sp Digitaria sp., Ipomoea sp., and Vernonia sp. Formulated mixture of metolachlor plus metobromuron (Galex) at 5 l/ha, followed by post-emergence

application of either Sceptre or Pursuit, and Pursuit plus pendimetholin (Stomp) at 0.5 + 2.0l/ha effectively reduced weed infestation by 60% and resulted in high cowpea grain yields. Other herbicide treatments of interest were: all treatments of metolachlor (Dual) plus promytrine (Codal), metolachlor plus Sceptre followed by supplementary hand-hoeing, squadron at 4.0 l/ha, and Pursuit plus Stomp at 0.25 + 2.5 l/ha.

Effect of nitrogen sources and rates on parasitic weeds.

Striga. Pot culture and field experiments were conducted respectively, at Samaru and Darazo to study the reactions of cowpea cultivars: Sampea-7, (Striga susceptible), SUVITA-2, (moderately Striga resistant), and a local check to nitrogen sources (ammonium nitrate (NH_4NO_3), ammonium sulfate $(NH_4)_2SO_4$, calcium nitrate ($Ca(NO_3)_2$) and urea) and rates (0, 30, 60, 120 and 240 ppm in pot culture and 30 and 60 kg N/ha for field studies).

In pot culture, Striga shoots emerged almost exclusively from the check pots (no N applied) of Sampea-7 and SUVITA-2. However, there was some Striga shoots in pots of SAMPEA-7 treated with 60 ppm of $Ca(NO_3)_2$ and those treated with 30 ppm of urea. No Striga emergence or attachment was observed in pots of treatments with N sources: NH_4NO_3 and $(NH_4)_2SO_4$. All N sources increased cowpea dry matter up to 30 ppm at which a decline was observed.

In the field, the date of first Striga emergence for each treatment was not recorded. However, cowpea ripening, all field plots treated and untreated, were heavily infested with Striga. Grain yields of cowpea cultivars: SAMPEA-7, SUVITA-2 and a local check were increased respectively by 73, 210 and 134 % in N treated as compared to untreated N pots. It appeared that, although N sources were unable to prevent Striga infestation, they were effective in improving the physiology of cowpea to tolerate Striga.

Responses of cowpea cultivars to Striga infestation. Sixteen cultivars were evaluated in Striga sick plot at Bakura under a late insecticide spraying regime (three insecticide sprayings commenced two weeks after some cultivars had flowered). Vita-3 combined low Striga shoot count and acceptable grain yield. B301 supported very low Striga shoot count and was the highest yielder. IT84D-566 was free from Striga shoots, but gave a low yield. Other cultivars of interests with very low Striga infestation were SR322, IT82D-849, IT86D-472, IT85S-1463 and IT86D-534.

Effect of millet and cowpea cultivars on the performance of both crops in an intercroping system. Three millet and five cowpea cultivars were used. Among the cowpea cultivars, IT81D-1137 (semi-erect) performed best in both pure and intercropped plots. Cowpea cultivars Ife Brown and SAMPEA-7 had the most and the least depressive effects on millet grain yield, respectively. Millet cultivars SE 2124, Naiwa and Ex-Borno had the most, intermediate and the least depressive effects on cowpea grain yield, respectively.

c) Entomology

Biology and bionomics of Clavigralla spp. Field observations of the pod-sucking bugs (Clavigralla spp.) showed that the adults occurred on cowpea before pods were produced. They later feed on both green and dry pods, but dry pods are preferred; the nymphs feed on green pods and were rarely found on dry pods.
Populations peak in October and November. Pigeon pea (Cajanus cajan) was found to be an alternative host of Clavigralla.

Chemical Control of Insect Pests. Of the four insecticides studied, Fastac (alpha cypermethrin) at 0.3 l/ha had the lowest number of thrips and Maruca testulalis. Karate super ED and Fastac at 0.3 l/ha were effective against pod sucking bugs. However, there were no significant differences among the grain yield of plots sprayed with different insecticides.

With regards to number of insecticidal sprays in one season, results showed that:

- For early maturing cultivars, two sprays could be adequate in northern Sudan savanna regions provided they are timely (i.e., flower bud formation and pod formation stages) and pods should be harvested as they dry up.
- For medium maturing cultivars, which bear fresh pods during a period insect populations are high, two sprays are not likely to be adequate in controlling insect pests. A third or even a fourth spray may be required.
- For daylength-sensitive cultivars, although studies were initiated only in 1988, there are indications that one or two sprays would probably be adequate. Further verification is still needed.

Screening cowpea lines for resistance to insect pests. Ten lines introduced from IITA-Ibadan bruchids and another 10 for aphids, were assessed for their reaction to Thrips and Maruca under three insecticide application regimes. Some lines showed low number of both insect pests. The study is to be repeated with local varieties included.

d) Pathology

The following experiments were conducted :

Assessment of yield losses caused by brown blotch (Colletotrichum capsici). Cultivars IT86D-1056 and IT86D-1057, resistant to most diseases with the exception of brown blotch were used. Different

amounts of diseases were generated in each variety by spraying at different frequencies with a tank mixture of fungicides, Benlate and Dithrone M-t5. The check plots were not sprayed. At 4 weeks after planting, plants were spray-inoculated with the conidial suspension of the fungus between 19.00 and 20.00 hours. Brown blotch severity appeared to be a good predictor of grain yield losses because plants that showed severe symptoms of the disease in all plots suffered the greatest yield loss. Both cultivars were highly susceptible to the pod phase of the disease which also severely affected grain quality.

Inheritance of resistance to Alectra vogelii in B301. Plants of four cultivars: B301, IT82D-849, SUVITA-2, and IT84S-2246-4; one F-1 population (B301 x IT84S-2246-4) and three F-2 populations (B301 x IT84S-2246-4), (B301 x SUVITA-2) and (B301 x IT82D-849) were studied in pot culture for their reaction to artificial infestations of the parasitic weed, Alectra vogelii. B301 and the (B301 x IT84S-2246-4) F-1 population were free of Alectra infestation, while plants of the other three cultivars were all susceptible. Plants of the three F-2 populations were segregating in the ratio of 1:13-16, susceptible: resistant. The backcross populations will be available for evaluation in 1990. It appears, thus, that the resistance in B301 to A. vogelii is most probably controlled by two complementary dominant genes.

Screening of the germplasm for resistance to Alectra. Lines introduced from IITA-Ibadan were grown in pot culture and artificially infested with Alectra seeds. The experiment was completed in 70 days after sowing. Different categories of lines were observed :

- Susceptible lines, which supported high number of both emerged and attached Alectra plants : SUVITA-2, IT84S-2246-4, VITA-3, SAMPEA-7 and IT87S-1252.

- Lines which supported few emerged Alectra plants but with relatively large number of attached Alectra plants. They exhibited symptoms of green leaves and brown upper internodes : IT81D-994 and IT86D-843.

- Resistant lines which supported few emerged and attached Alectra plants: B301, IT86D-472, IT86D-534.

Screening cowpea lines for multiple disease resistance. Lines mostly from IITA-Ibadan international trials were screened for multiple disease resistance under field conditions. The diseases studied were scab (Elsinoe phaseoli), Septoria leaf spot (Septoria vignae), brown blotch (Colletotrichum capsici), bacterial blight (Xanthomonas campestris pv. vignicola). Only scab and Septoria leaf spot were subjected to artificial inoculation in the field.

Results are as follows:

- Extra early lines: only IT86D-1056 appeared to possess combined resistance to Septoria leaf spot and scab. It was however, highly susceptible to bacterial blight at Samaru and Minjibir.

- Medium maturing lines: none of the lines combined resistance to both scab and Septoria leaf spot. IT84S-2246-4 had moderate resistance to both diseases but was highly susceptible to bacterial blight at Minjibir.

- Bruchid resistant lines: none of the lines combined resistance to scab and Septoria leaf spot. IT86D-560 had some reasonable level of resistance to both diseases but was highly susceptible to bacterial blight at Minjibir.

- Aphid resistance: only IT87S-1394 appeared to have combined very high level of resistance to Septoria and moderate resistance to scab, but was highly susceptible to bacterial blight at Samaru and Minjibir.

- Vegetable cowpea: all lines were susceptible to scab.

- Virus resistance trial: only IT82D-889 combined very high level of resistance to Septoria leaf spot and moderate resistance to scab, but was highly susceptible to bacterial blight.

SENEGAL

The national cowpea program of Senegal conducted research activities in the areas of breeding and entomology. However, the annual report received in February 1990 covered only the breeding section. The entomology and pathology sections were to be brought by Mr. N. Cisse at the end of March when the Steering Committee was to meet. Unfortunately, because of health reasons Mr. N. Cisse was not able to attend the meeting. Therefore, only the breeding aspect is covered in this report.

a) Breeding

Preliminary yield trial.One hundred and seventy four lines extracted from crosses involving cultivars TVu300 and IT83S-742-13 (aphid resistant) and Mougne, TVx3236, Bambey-21, CB-5, TN88-63, IS86-292, IS86-235 were tested for field at Bambey in 1989. Some high yielding lines with good seed quality were identified.

Advanced yield trial. Three new promising lines (IS87-416, IS87-432 and IS87-437) selected for tolerance to thrips and resistant to bacterial blight and virus in the 1987 and 1988 preliminary yield trials were in 1989 compared to the best commercial cultivars: 58-57 and Mougne at four locations (Bambey, Thilmakha, Louga and Ndiol). The lines out-performed the check cultivars: 58-57 and Mougne only at Bambey and Thilmaka. They were out-yielded by 58-57 at Louga and Ndiol.

Line IS87-416 was confirmed resistant to bacterial blight and virus diseases and tolerant to thrips, insect pests, although it was not the best yielder.

Responses of cowpea cultivars to plant population densities. Ten cultivars were tested at two plant population densities and spacings (50 x 50 cm and 50 x 25 cm corresponding respectively, to 40 and 80 thousand plants per hectare) at Bambey, Thilmakha, Louga and Ndiol. At Bambey and Ndiol, in contrast with the 1988 results, the spacings: 50 x 50 cm, induced the highest yield as compared to the 50 x 25 cm spacing. At Thilmakha and Louga, the superiority of 50 x 25 cm observed in 1988 was confirmed.

Multi-line Trial. Mixtures of four lines and cultivars (58-57, Mougne, IS86-191, and IS86-2) with different maturities were tested in order to identify those that could provide stable yield in spite of variable environmental conditions. The trials were conducted at Bambey, Louga and Thilmakha.

At Bambey, 58-57 and Mougne were out-yielded by their respective mixtures, while at Thilmakha and Louga, 58-57 was the highest yielder. A combined analysis of variance over a two-year period (1988 and 1989) showed that the 1:1 mixture of 58-57 and IS86-191 gave the highest yield at Louga and Thilmakha; whereas, at Bambey, IS86-191 was the highest yielder.

Striga Resistance Trial. Senegalese cultivars and lines, Mougne 58-57, IS86-283 and IS86-275 were compared to SAFGRAD-RENACO cultivars of known Striga resistance characteristics in a Striga sick plot at Ndatt-Fall. The number of Striga shoots on Senegalese cultivars Mougne and 58-57 was comparable to that of SAFGRAD-RENACO known Striga susceptible cultivar IT82E-32. IS86-283 had few Striga shoots as did B301, KVx396-4-4-4 and KVx396-4-4-2. IS86-275 was free from Striga as were IT82D-849, TN93-80, SUVITA-2, KVx396-6-1, KVx396-11-6 and TN121-80.

3.2. REGIONAL TRIALS

The conduct of regional trials is considered the most appropriate means by which new technologies developed either by RENACO Lead Centers or IITA-GLIP can be transferred to national programs. There are two main objectives for these trials: (1) to evaluate the performance of improved technologies over a wide range of environments, and (2) to provide national programs an opportunity to select new technologies for further testing and use, either directly as new crop variety or agronomic practice or as a source of breeding material. National programs conducted regional trials because technologies evaluated were of great interest to them and their local farmers in their respective countries. They were urged to analyse data and report them in their annual progress report for local exploitation.

Out of 53 regional trials sent out in 1989, data of 42 trials were received by the RENACO Coordinator as of March 1990. A summary of the results is presented in the following pages.

Regional Adaptation Trial for the Northern Guinea Savanna Zone. The trial was requested by Benin, Burkina Faso, Cameroon, Côte d'Ivoire, the Gambia, Ghana, Nigeria and Togo. Feedback had been received from all these participating countries.

Cultivar KN-1 out-yielded other cultivars only in the deep south and rainy locations: Nyankpala (Ghana), Zaria (Nigeria) and Bouake (Côte d'Ivoire). Cultivars KVx396-18 was either the best or among the best yielding cultivars at all locations. It was followed by KVx396-4-2 and KVx396-4-4.

Regional Adaptation Trial for the Sahelo-Sudanian zone. The trial was conducted in Burkina Faso, Cameroon, Guinea Bissau, Niger, Nigeria, Mauritania and Tchad. By the time of this write-up, only five countries had sent feedback to the Network Coordinator.

Cultivar KVx396-4-5 was either the highest or among the high yielding cultivars at all locations; it was followed by cultivars KVx396-18-10 and KVx 396-4-4. Cultivars KVx30-309-6G and KVx396-11-6 were among the low yielding cultivars at all locations.

Regional Adaptation Trial for the Transition Zone

The trial was requested by Guinea Conakry and Togo. Feedback was received from both countries. Seed yield of cultivars differed statistically only at Kilissi, Guinea Conakry; IT82E-32 and Dembo, (used as local check, but introduced in Guinea from Burkina Faso) yielded highest whereas other cultivars did not differ significantly from one another. It should, however, be pointed out that although cultivars IT82E-16, IT81D-1137 and TVx1999-01F, were not statistically different, they yielded highest at Kankan (Guinea-Conakry) and at Ativeme (Togo).

Regional Cowpea Striga Resistance Trial

The 1989 regional Striga resistance trial was requested by 6 countries: Benin, Mali, Niger, Nigeria, Senegal and Tchad. By the time of this write up, only Mali, Nigeria, Senegal and Tchad had sent feedback to the Network Coordinator.

The susceptible check, IT82E-32, showed consistently heavy Striga infestation at Koporo (Mali), Minjibir (Nigeria) and Ndatt-Fall (Senegal). Cultivars IT82E-849 and TN121-80, and to some extent TN93-80 were free from Striga infestation in all the three locations. SUVITA-2 showed some Striga infestation only at Minjibir (Nigeria) whereas cultivar B301 was consistently less densely infested with Striga at the three locations. With regards to grain yield, TN121-80 was the only Striga resistant cultivar that combined high yield and good grain quality acceptable to farmers in Mali as well as Nigeria.

Regional Aphids Resistance Trial

The trial was requested by Burkina Faso, Cape Verde, Guinea Bissau, Guinea Conakry, Niger, Nigeria, Tchad and Togo. Feedback was received from all countries except Guinea Bissau and Niger. Cultivar IT82E-25 was among the high yielding cultivars at all locations ; it was followed by the local check at most locations.

Aphids resistance bio-test was conducted only in Burkina Faso. Cultivar IT82E-25 was also resistant to aphids infestation. Other resistant cultivars included IT87S-1459 and IT86D-888 while cultivars IT87S-1390 and IT87S-1394 were tolerant.

Regional Bruchids Resistance Trial

The trial was requested by Burkina Faso, Cameroon, Cape Verde, Guinea Bissau, Guinea Conakry, Nigeria, Mali, Mauritania, Tchad and Togo. Feedback was received from Burkina Faso, Cape Verde, Guinea Conakry, Mali, Nigeria, Tchad and Togo.

With the exception of Kankan (Guinea Conakry) and Ativeme (Togo) the local check cultivar was the highest or among high yielding cultivars at all locations; it was followed by cultivars IT86D-1038, except at Gassi (Tchad), and to some extent by IT86D-713 and IT84S-2246. With regards to bruchids resistance, only Burkina Faso and Togo conducted the bruchids bio-test. Cultivars IT86D-498 and IT84S-2246 were confirmed highly resistant to bruchids in Burkina Faso whereas cultivars IT86D-1039, IT87D-1827 and to some extent IT86D-560 were confirmed resistant in Togo.

3.3. VISITS TO NATIONAL PROGRAMS

The Network Coordinator visited six countries during the 1989 crop season. The objectives of the visits were to:

- get acquainted with realities of the national cowpea programs including cowpea production and research constraints and see the kind of efforts made to overcome them.
- visit cowpea fields and laboratory research facilities as well as farmers' fields.
- inventorize research activities of interest to the cowpea network but which may not necessarily be conducted by national scientists in the countries visited.
- visit RENACO's regional cowpea trials
- discuss on-the-spot with cowpea scientists about their research problems for eventual technical assistance to them in research methodology and technology transfer.

The countries visited were Cameroon, (19-24 June); Guinea Bissau (1-4 August); Mali (5-9 August); Côte d'Ivoire (9-13 August); Ghana, (15-20 August); Benin, (21-26 August) and Togo (26 August to 3 September 1989).

With the exception of Mali and Northern Cameroon, the countries visited belong to the humid or sub-humid ecologies and the Southern and Northern Guinea Savannas. Ghana, Togo and Benin have in addition a coastal climate in the deep south. The southern coastal climate, with less than 1000 mm rainfall for two seasons can be described as semi-arid. Apart from the northern Guinea savanna zone, the rainfall of these countries is bimodal with two seasons, one major and one minor. The southern and northern Guinea savannas are characterized by very humid months of July, August and September (200-300 mm rainfall each).

In these countries, erect or semi-erect and disease resistant cultivars with smooth seeds are the most adapted. They can be grown in the major or minor season or planted at the beginning of the cropping season in Guinea savanna zones. In contrast, prostrate cowpea cultivars with rough seeds can be sown only in the minor season or after mid-July in the Guinea savanna zones. This is crucial in protecting cowpea against two devastating diseases: web blight, caused by Corticium solani, and pod, seed rot diseases.

Striga gesnerioides infestation is of economic importance in the semi-arid coastal stripes as well as in marginal lands-gravelly, lateritic and shallow soils which are often grazed by livestock in the Guinea savanna zones. In order to prevent Striga epidemic in these areas, as is the case in the Bohicon region of Benin, new cowpea cultivars intended for release must be proven to be Striga resistant.

The following technologies developed through networking are presently being exploited by sientists and/or farmers in the visited countries.

(i) - Minimum insecticide applications : two or three insecticides sprays at critical growth stages is gaining acceptance in national programs; it is being tested extensively in Ghana and Cameroon.

(ii) - Cowpea cultivars being cultivated by farmers.

Country	Cowpea cultivars
Guinea Bissau	IT82E-9
Ghana	IT82E-16 and IT82E-32
Mali	SUVITA-2 and KN-1
Benin	TVx1850-01F, Vita-5, IT82E-32 and IT81D-1137
Cameroon	IT81D-985 (BR1) and IT81D-994
Togo	IT81D-985 (Vitoco), Vita-5

It should be noted that SUVITA-2 (Gorom Local), a Striga resistant cultivar from Burkina Faso is being extensively cultivated in Mali, in the Seno region, where it is not only high yielding with good quality seed, but also controls Striga infestation. Cultivars KVx61-1 and KVx61-74, both Striga resistant, are in the pipe line for release to farmers in Mali.

3.4. TRAINING

A group training session on "Technology development and Transfer" was held at Kamboinse/Ouagadougou, Burkina Faso, 10-24 September, 1989, by RENACO in cooperation with the "Institut d'Etudes et de Recherches Agricoles" (INERA).

National scientists from seven countries participated: Benin (Dr. J. Detongnon), Côte d'Ivoire (Mr. Adou Amalaman), Guinea Bissau (Mr. Abu Biai), Guinea Conakry (Dr. Fode Laye Guilavogui), Mali (Mr. K. Ondie, Mr. S.O. Katile, Mr. D. Sogodogo and Mme D.N. Yaro), Niger (Mr. A. Moutari), and Tchad (Mr Oueitar Gam).

The training consisted of lectures given by scientists from INERA and RENACO (Dr. N. Muleba, Dr. J. Detongnon, Dr. G. Kingma and other participating scientists). Each lecture was followed by discussions led by a chairperson. The following topics were covered.

- Factors affecting cowpea productivity,
- Peasant farmer,
- Appropriate technologies,
- Agricultural experimentation and technology transfer,
- Variety maintenance and seed multiplication.

3.5. FINANCIAL ASSISTANCE TO NATIONAL PROGRAMS

In order to facilitate the smooth execution of cowpea research activities by Lead Centers as well as Technology Adopting Centers, financial assistance was provided as follows upon request and presentation of a proforma invoice:

Country	For purchase of material or equipment	First instalment	Second instalment
Benin	174.000	-	-
Burkina Faso	-	1.050.000	900.000
Cameroon	-	285.000	285.000
Cape Verde	180.000	-	-
Côte d'Ivoire	175.382	-	-
The Gambia	580.00 $	-	-
Ghana	580.00 $	-	-
Nigeria	-	2.000.00 $	-
Senegal	-	427.000	450.000
Togo	180.000	-	-
Guinea Conakry*	354.000	-	-
Guinea Bissau	180.000	-	-
Mauritania	180.000	-	-

* Guinea Conakry has received a total sum of 354.000 CFA being reimbursement of expenses incurred at 174.000 CFA in 1988 and 180.000 for activities of the 1989 crop seasons, respectively.

3.6. MISCELLANEOUS

In addition to RENACO activities, IITA-GLIP carried out following activities towards strengthening the capacity of national programs.

Visits of IITA-GLIP core scientists to national programs

Two IITA-GLIP scientists, a virologist, Dr. H. Rossel and a pathologist, Dr. K.F. Cardwell, visited national cowpea programs of Nigeria, Niger, Burkina Faso and Togo in late September, 1989. The objective of their visit was to survey fungal, bacterial and viral diseases and Striga infestations in the countries visited.

The most important observations made during their visit were that diseases were not major constraints in Nigeria, Niger and Burkina Faso in 1989. At the Kamboinse Station, the incidence of diseases was less important in 1989 than in 1988, a very rainy year. However, cultivar IT85F-1380, resistant to cowpea aphids borne mosaic virus (CAbMV) disease in Nigeria, was found to be susceptible to the disease at this station. Ife Brown, susceptible to CAbMV in Nigeria, seemed, together with KN-1 (Vita-7) and KVx396-4-4, resistant to the disease at Kamboinse. It appeared, thus, the strain of CAbMV at Kamboinse could be different from that at Ibadan, Nigeria.

High viral disease incidences were observed in the northern Guinea savanna in Togo between Kande and Sotouboua. The following viruses were identified to occur in Togo, sometimes reaching epidemic levels: cowpea mottle virus (CMeV), cowpea yellow mosaic virus (CYMV), MSV and SBMV.

IITA-GLIP Field Days

Both IITA-GLIP outreach programs in savanna regions (Sadore, Niger and Minjibir, Nigeria) held field days in September 1989. The objective of the field day was to promote interaction and exchange of experiences and technologies with national cowpea scientists from RENACO's Lead Centers. National scientists from Burkina Faso and Niger attended the IITA-GLIP-ICRISAT field day at Sadore, Niger; and those from Nigeria attended the IITA-GLIP-IAR field day at Minjibir, Nigeria.

IITA-GLIP Annual Research Review

In support of national programs through networking and to allow them the opportunity of providing inputs at both planning and evaluation levels of research activities, IITA-GLIP invited SAFGRAD Director of Research, Dr. T. Bezuneh, Dr. G. Kingma, Senior SAFGRAD-USAID Advisor, the RENACO Chairman, Rapporteurs and two members of the Steering Committee; and the Network Coordinator to participate at its 1990 Annual Research Review. Dr. Kingma was not able to attend the meeting. Useful interaction took place during the meeting. National scientists from RENACO Lead Centers of Senegal, Niger and Burkina Faso were invited to participate at the IITA-GLIP field day in Niamey in September 1990; those of Nigeria, Cameroon and Burkina Faso were invited to attend the IITA-GLIP field day at Minjibir/Kano in Nigeria in September 1990. IITA-GLIP scientists have expressed their willingness to take part in the RENACO monitoring tour to Burkina Faso, Niger and Nigeria including IITA-Ibadan. The tour will start on 27 August at Ouagadougou and end on 15 September at Ibadan, Nigeria.

MAJOR PROBLEMS ENCOUNTERED

Three years after their establishment, both the Maize and Cowpea Collaborative Research Networks for West and Central Africa have made remarkable progress towards the attainment of the Project objectives. For each Network, production constraints have been identifed, research priorities established and responsibilities allocated among national programs. Both Lead and Technology Adopting NARS are now better convinced of the importance and benefits of this collaborative approach--networking. Lead Centers by widely testing their new technologies through regional trials within the network, have the opportunity to identify the strength and weakness of their technologies and can subsequently make necessary adjustments. Technology Adopting Centers, by conducting regional trials, are in a position of identifying new and relevant technologies which they can pass on to their farmers eitheir directly or after appropriate local refinement.

Nevertheless, certain prevailing problems need to be addressed if sustainable and effective NARS-managed Networks are to emerge within the shortest time possible.

1. Inadequate Pool of Scientists

In both Networks, most of the member-countries do not have the basic minimum or critical mass of scientists and technicians to carry out research appropriate to the increasing socio-economic importance of these two staple food crops in the sub-region. For example in maize, Cameroon, Togo and Côte D'Ivoire are among the Lead Centers and yet the national project coordinator in these countries are the sole trained breeders. Deploying any of them to other positions will not only disrupt the activities of the particular country but also adversely

affect the capacity of the Network. For instance, in the Cowpea Network, the departure of Mr. I. Maga of Niger on study leave has virtually brought the coordination of the Niger Cowpea Program to a stand-still, not mentioning the breeding activities for which he was directly responsible. Although both Networks have taken some palliative measures in terms of Seminars for Scientists and short-term training for technicians, a vigorous higher degreee training is absolutely and urgently required, preferably as a component of the next phase of the Project.

2. Need for Increased Government Funding of National Programs

Many national government do not make adequate investment to support agricultural research. Remunerations are low, research equipments are scarce, and operational funds are inadequate. All these result in difficulties to attract, motivate and retain capable scientists and technicians within the National Programs.

3. Cumbersome Government Procedure

The progress hitherto recorded by the Networks has been due, largely, to the cooperation received from the NARS Directors and their scientists. But in some instances, responses to Networks' initiatives and overtures have been delayed. This affects long-term commitment and expected results. For example, nominations for participation in training or some other network activities are made but the prospective participants fail to turn up. There is a need to accord high priority to issues relating to agricultural research as a prerequitite for technological development.

RECOMMENDATION FOR IMPROVEMENT AND FOLLOW-UP ACTIVITIES FOR NEXT YEAR

Research work-plans received from Lead Centers for the 1990 cropping season have clearly demonstrated that NARS, with modest additional financial assistance from the Networks, NARS are capable of conducting good research programs and encouraging results have been obtained. For example, the national program of Burkina Faso initiated an aggressive breeding project for combining resistance to several diseases of cowpea in the Northern Guinea Savanna. Similarly, the Cameroon national program recorded remarkable progress in Striga research in maize. Research efforts will be continued by these centers and all the other Lead Centers of both Networks during the following year. The Monitoring Tours of both Networks planned for August/September will afford scientists from other countries opportunity to benefit from the techniques and approaches in use in these Lead Centers. The Maize Network Monitoring Tour is planned for Cameroon and Nigeria while Cowpea network will visit Burkina Faso, Niger and Nigeria. The two tearms will comprise scientitsts from Lead and Technology adopting Centers in order to enhance interaction and balanced growth of the Networks.

In order to guarantee consolidation and progress in the Network and prevent possible retrogression, a comprehensive higher degree training program is urgently required for NARS scientists. The Networks have appraised the current status of manpower in the participating NARS and the Steering Committees have prepared a 5-year training schedule including cost estimates. It is recommended that this be favorably considered during the process of developing SAFGRAD Phase III.

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